REMARKS

The Office Action of November 05, 2004 has been reviewed and the Examiner's comments carefully considered. The present response is directed to the Examiner's rejection of claims 1-20. Claims 1-20 are pending in this application.

In the Office Action, the Examiner rejects claims 1-20. Specifically, these claims stand rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 6,718,312 to McAfee et al. (hereinafter "the McAfee patent") in view of U.S. Patent No. 6,272,473 to Sandholm. In view of the following remarks, Applicants respectfully request reconsideration of these rejections.

Independent claim 1 of the present application is directed to a method of selecting one or more winning bids in a combinatorial auction. This method includes receiving a plurality of bids, each comprising one or more items, and an associated value; then, designating a subset of the received bids as a current allocation, wherein each bid has no overlap. The method further includes determining a plurality of neighboring allocations and replacing the current allocation with one of the neighboring allocations. The replacement allocation is one neighboring allocation selected from the plurality of neighboring allocations, either stochastically or heuristically, and updating a best allocation with the current allocation. The above mentioned steps of determining a plurality of neighboring allocations, replacing the current allocation, and updating a best allocation are repeated M times. The replacement is determined stochastically a first part of M times and is based on the heuristic value a second part of M times. Claims 2-12 depend directly or indirectly from independent claim 1.

Independent claim 13 of the present application is directed to a method of selecting a winning allocation of bids in a combinatorial auction. This method includes receiving a plurality of bids, designating a subset of the bids as a current allocation, determining a neighboring allocation, and determining for each neighboring allocation a heuristic. The heuristic is determined so that it is indicative of a capacity of the neighboring allocation to increase a sum of the values of the bids of the current allocation. The method continues by selecting one of the neighboring allocations and replacing the current allocation with the selected neighboring allocation. The selection of each neighboring allocation is done stochastically a part of M times and is based on the determined heuristics the remainder of M times. The sum of the values of the bids of the current allocation are compared to a sum

of the values of the bids of a best allocation, if greater than or equal, the current allocation is substituted for the best allocation. Claims 14-17 depend directly or indirectly from independent claim 13.

Independent claim 18 of the present application is directed to a method of selecting one or more bids in a combinatorial auction. This method includes receiving a plurality of bids, designating a subset of the bids as a current allocation, combining each bid not part of the current allocation with the current allocation to form a corresponding neighboring allocation, selecting one of the neighboring allocations stochastically or based on a heuristic, replacing the current allocation with the selected neighboring allocation, and repeating these steps M times, with the selected neighboring allocation being selected stochastically the first part of M times and with the selected neighboring allocation being selected heuristically a second part of M times. The heuristic is indicative of a capacity of the selected neighboring allocation to affect a sum of the values of the bids of the current allocation. Claims 19-20 depend directly or indirectly from independent claim 18.

The McAfee patent is directed to a method and system for dynamic combinatorial auctions which produce efficient auctions by way of an optimization subroutine (see McAfee at column 11, lines 44-50). Because the McAfee patent utilizes an optimization subroutine to deterministically find optimal solutions, McAfee simply has no need to use stochastic and heuristics to find probabilistic solutions, as is the case in the present invention. In this regard, because the McAfee patent teaches the use of deterministic means (the optimization subroutine) to determine the optimal solution, the McAfee patent teaches away from the present invention which utilizes probabilistic means (stochastics and heuristics) to determine high-quality, but not necessarily optimal solutions.

McAfee has, as its goal, the reward of bidders who bid for the smallest relevant combinations at any point during the auction by offering them additional bidding flexibility later in the auction while, at the same time, not disadvantaging bidders who genuinely want to bid on large combinations to avoid exposure problems. The auction utilizes three types of bid restrictions in order to achieve its claimed goal. The bid's composition must satisfy one or more of: (1) non-additive activity restrictions, (2) subset restrictions, and (3) superset restrictions.

The McAfee patent does not describe the same problem as the present invention. McAfee discusses implementing bid restrictions and not letting bidders provide arbitrary bids to get increased efficiency, while also proposing a method for multi-round bidding. In contrast, the present application is a method that determines allocations given fixed collections of bids whether restricted or not. It is true that McAfee discusses a current allocation, but in the McAfee patent, the current allocation refers to something entirely different than current allocation in the present invention. In the McAfee patent, the current allocation is an optimal allocation determined by an optimization subroutine, given the current bid data, and is used to give bidders a chance to revise their bids. In the present application, the current allocation is an internal allocation, namely, something stored and revised repeatedly in order to try to find a high-quality, perhaps optimal, allocation.

The Sandholm patent is directed to a method to determine the optimal allocation of bids in an auction by systematically searching out every candidate allocation. The method of Sandholm stores bids in a binary tree which is searched in conjunction with a stopmask data structure. This allows parts of the binary tree to be instantly and explicitly pruned during the search. Depth-first search in this tree can be done in place without an open list or through recursive calls. The main search method of Sandholm generates each allocation of positive value once but does not generate others.

In Sandholm, the foremost objective of the auction is to determine the optimal solution by systematically and exhaustively searching out every candidate allocation. In the present invention, through the use of stochastic and heuristic search methods, a high-quality solution, and, perhaps, an optimal solution is found much faster, in some cases one thousand times faster, than prior art auctions. While Sandholm is deterministic and does not compromise optimality, the present invention is nondeterministic (i.e., probabalistic), targets high-quality solutions and uses a random component that is guided through the use of stochastics and heuristics in order to find a solution.

While the present invention and the Sandholm patent are combinatorial auctions, sharing some of the same basic qualities in common, there are clear fundamental differences between the two. In Sandholm, the stated objective is to determine an optimal allocation, whereas in the present invention the stated objective is to determine a high quality allocation by not explicitly considering the search space of all allocations. In some scenarios,

Sandholm may not consider the entire space either but this is due to the use of specific pruning rules, where only allocations that are provably suboptimal are removed from consideration.

In the present application, at each state of the computation, the overall course of the computation is not completely determined by the program, the starting state, and the initial inputs. The Sandholm patent does not teach or suggest nondeterminism nor selecting allocations stochastically, probabilistically or any variants thereof, as set forth in independent claims 1, 13, and 18 of the present application. Further indication of the deterministic nature of Sandholm is shown in claim 1 of the Sandholm patent where it explicitly talks about optimal allocations. In claim 3, Sandholm claims the use of an iterative-deepening A* search, which is a complete and exhaustive search algorithm. In other words, the overall course of Sandholm is completely determined by the starting state and the inputs.

Additionally, the Examiner asserts that Sandholm teaches "determining a plurality of neighboring allocations comprising the combination of the current allocation and a new bid selected from the bids not part of the current allocation or any other neighboring allocation." The Sandholm patent discusses a way to exploit sparseness of bids, but nowhere does it reference determining a plurality of neighboring allocations stochastically or heuristically. Moreover, Sandholm teaches away from this assertion through the use of a tree and a depth-first search to combine items into allocations. The Examiner further states that Sandholm teaches "repeating these steps M times wherein the neighboring allocation is selected stochastically a first part of M times and is selected based in the heuristic value a second part of M times." There is nothing in the Sandholm patent that discusses any sort of repetition, especially one using stochastics or heuristics. Rather, Sandholm simply exhaustively searches all allocations and, as Sandholm is deterministic in nature, there is nothing left to chance and, again, teaches away from a probabilistic solution.

For the above reasons, none of the McAfee patent, the Sandholm patent, nor any of the prior art of record teaches or suggests a method for use of stochastic and heuristic search methods to determine high-quality solutions, but not necessarily optimal solutions, much faster, in some cases one thousand times faster, than prior art auctions, as specifically set forth in independent claims 1, 13, and 18 of the present application. For the foregoing reasons, independent claims 1, 13, and 18 are not anticipated by or rendered obvious by the

McAfee patent and/or the Sandholm patent. There is no teaching or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Accordingly, reconsideration of the rejection of independent claims 1, 13, and 18 is respectfully requested.

Claims 2-12 depend directly or indirectly from independent claim 1, claims 14-17 depend directly or indirectly from independent claim 13 and claims 19-20 depend directly or indirectly from independent claim 18 and are believed to be allowable for the reasons discussed hereinabove. Therefore, for all the above reasons, reconsideration of the rejection of claims 1-20 is respectfully requested.

CONCLUSION

For all the foregoing reasons, Applicants believe that claims 1-20 are patentable over the cited prior art and in condition for allowance. Reconsideration of the rejection and allowance of all pending claims 1-20 are respectfully requested.

Respectfully submitted,

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